Long-Acting Insulin Analogs Versus Insulin Pump Therapy for the Treatment of Type 1 and Type 2 Diabetes

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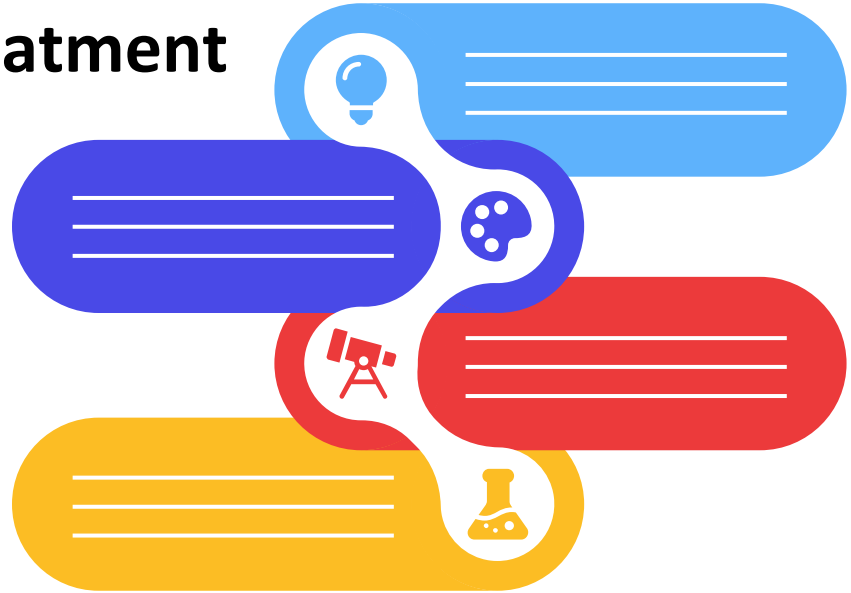


Pickup, J. C., & Renard, E. (2008). Long-acting insulin analogs versus insulin pump therapy for the treatment of type 1 and type 2 diabetes. *Diabetes care*, *31 Suppl 2*, S140–S145. https://doi.org/10.2337/dc08-s235

01 introduction

Insulin pump therapy (continuous subcutaneous insulin infusion [CSII]) is now an established form of intensive insulin treatment. It is pertinent to ask, however, if multiple daily injection (MDI) regimens based on new long-acting insulin analogs such as glargine and detemir have now replaced the need for CSII.

In type 1 diabetes, CSII reduces the frequency of severe hypoglycemia compared with isophane-based MDis, but the rate of severe hypoglycemia is usually similar on glargine- or detemir-based MDIs compared with isophane-based MDIs. CSII reduces AIC and glycemic variability compared with isophane-based MDis; but glargine and detemir do not improve AIC or variability in many patients, particularly those who are prone to hypoglycemia Head-to-head comparisons of CSII with MDI based on glargine indicate lower AIC, fructosamine, or glucose levels on CSII.

02

Aim

The aim of this study is to determine the using of insulin pump therapy in modern clinical practice and to consider whether glargine and detemir can substitute with equal or better performance

03 Method

The methods used in this research paper include:

1. Clinical Trials:
The research paper references various clinical trials that have compared the efficacy of CSII with MDI regimens based on different types of insulin formulations. These trials involved randomized controlled studies and before/after studies to evaluate outcomes such as severe hypoglycemia, A1C levels, and glycemic variability.

2. Patient Groups:
The authors considered different patient groups, including adolescents, pediatric patients, adults, and hypoglycemia-prone type 1 diabetic subjects, to assess the impact of insulin pump therapy and long-acting insulin analogs on glycemic control.

03 Method

3. Comparative Studies:
The research paper includes comparisons between CSII and MDI regimens based on long-acting insulin analogs such as glargine and detemir. These comparisons were made in terms of A1C levels, hypoglycemia rates, glycemic variability, and other relevant parameters.

4. Data Analysis:
The authors analyzed data from the clinical trials and studies to draw conclusions about the effectiveness of insulin pump therapy versus MDI regimens using long-acting insulin analogs in managing diabetes.

04 Results

Table 1- Randomized controlled trials

	Patient group	Hypoglycemia reduction (%)
Cohen et al. 2003	Adolescents	79
Weintrob et al. 2003	Pediatric	66
Hoogma et al. 2005	Adults	60

Table 2- Before/after studies

	Patient group	Hypoglycemia reduction (%)
Hunger-Dathe et al. 2003	Adults	72
Linkeschova et al. 2002	Adults	93
Bruttomesso et al. 2002	Adults	71

Table 1 Some recent studies comparing severe hypoglycemia in type 1 diabetes during CSII and MDI

04 Results

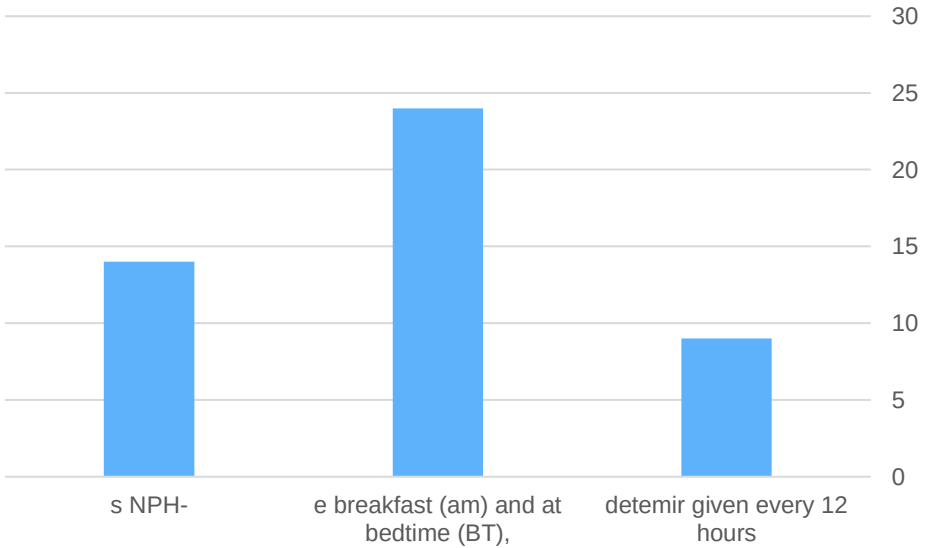
In the previous study the Question was can we replace MDI with CSII?

The answer according to the study is YES because the during the CSII the hypoglycemia reduced by 75%.

04 Results

Second study.

Figure 1—Number of severe hypoglycemic episodes in type 1 diabetic subjects allocated to MDI based on detemir given every 12 hours, or before breakfast (am) and at bedtime (BT), versus NPH-based MDI.



(Home et al, 2004)

04 Results

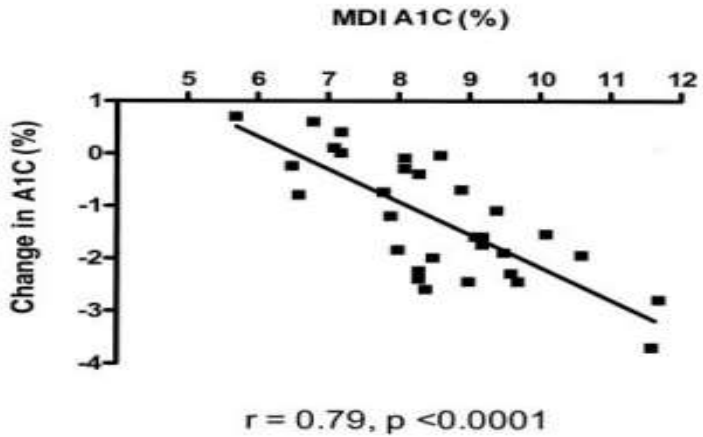
Table 2—Some randomized controlled trials showing a comparable mean A1C percentage during isophane (NPH)-based MDI and long-acting analog– based MDI in type 1 diabetes

	Mean A1C (%)	
	NPH	Analog
Raskin et al. 2000	7.6	7.5 (glargine) (NS)
Ratner et al. 2000	7.5	7.5 (glargine) (NS)
Hermansen et al. 2004	8.1	7.9 (glargine) (NS)
Home et al. 2004	7.9	7.8 (glargine) (NS)
Russell-Jones et al. 2004	8.4	8.3 (glargine) (NS)

NS, no significant difference between groups

04 Results

Figure 2—Correlation in type 1 diabetes between the A1C on MDI and the subsequent change in A1C when patients were switched to CSII.



(From Pickup et al, 2006)

Changing most of the glargine-treated type 1 diabetic patients to CSII resulted in a marked improvement in mean A1C.

Allocated 32 type 1 diabetic subjects to aspart and glargine MDI or CSII using aspart over 16 weeks and showed significantly lower A1C on the pump.

(Doyle et al. 2004)

04 Results

Hirsch et al. 2005 randomized **100 type 1 diabetic subjects** to glargine/aspart MDI or CSII with aspart **for 5 weeks** and showed both a significantly **lower fructosamine** and area under the curve of **glucose**, as measured by a continuous glucose monitoring system **during CSII** compared with **glargine MDI**

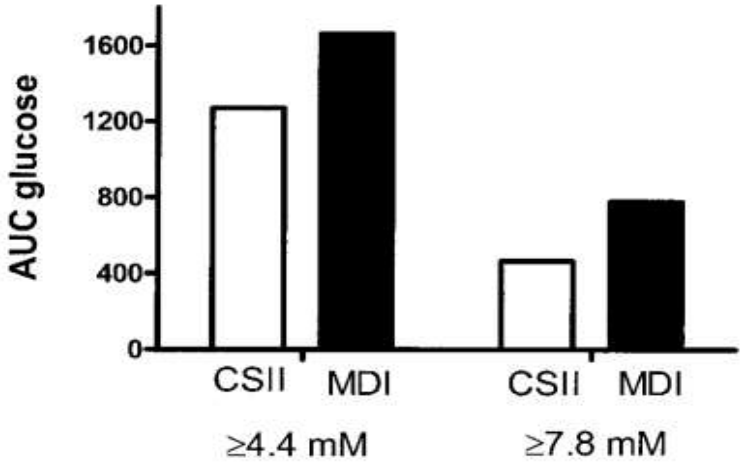


Figure 4 Area under the curve (AUC) for glucose (either 4.4 or 7.8 mmol/l) measured by a continuous glucose monitoring system in type 1 diabetic subjects treated by CSII or MDI based on glargine. **(Hirsch et al. 2005)**.

05 Discussion

1.The discussion underscores the importance of CSII in improving blood sugar and reducing glycemic defects in patients with type 1 diabetes.

2.Although there are long-acting natural analogues, CSII remains a valuable treatment option for special patients prone to severe hypoglycemia or severe diabetes who have difficulty controlling their blood levels using sophisticated devices.

3.In type 2 diabetes, CSII may offer more benefits than metered-dose contrast devices in certain patient groups, although more research is needed to consider alternative treatment.

4. Discussion highlights challenges with CSII, including cost, vacation time, and the need for trained staff.

05 Discussion

5.Continuous evaluation and patient education are essential, and blood sugar should be controlled with CSII.

6.It was agreed that there was a need for general reading in order to seek a better understanding of the role of CSII in type 2 diabetes and therefore the best fit for this treatment.

7.The results and discussion underscore the importance of CSII as a treatment option in both type 1 and type 2 diabetes, especially patients with specific needs or challenges with metered-dose therapy.

(Raskin, Bode, Marks, Hirsch 2003)
(Saudek , Duckworth , GiobbieHurde,1996)

06

Conclusion

- MDI (multiple daily injection) using glargine or detemir has achieved significant improvement in diabetes control in many type 1 diabetic subjects, particularly with regard to improved glycemic variability and reduced nocturnal hypoglycemia and fasting blood glucose concentration.

- However, many type 1 diabetic patients continue to have poor control after best attempts with analog-based MDI because of frequent severe hypoglycemia and/or elevated A1C. These people are usually markedly improved by switching to CSII (continuous subcutaneous insulin infusion),and thus based on present evidence, we conclude that long-acting insulin analogs have not replaced the need for insulin pump therapy.

- Further clinical studies are needed to provide stronger evidence on the indications for pump treatment in type 2 diabetes.

- The need for a more evidence-based approach to indications is supported by the higher cost of CSII and the higher number of type 2 diabetic patients.

- Health care systems and insurance organizations are unlikely to accept patient preference on its own as the main indication for CSII.

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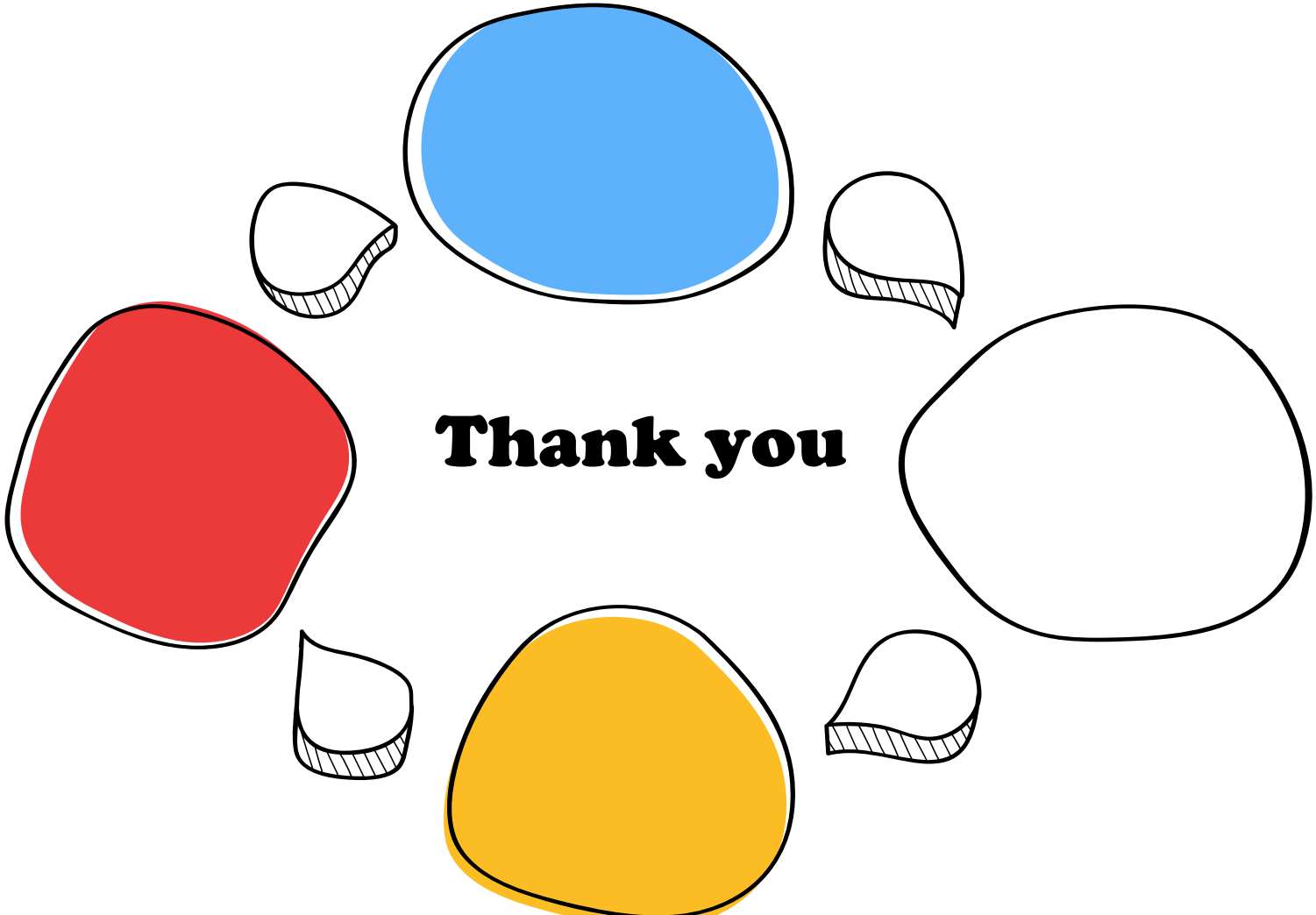
Thank you